Patterson Prize in Clinical Surgery

A CASE OF PENILE HYPOSPADIAS.

Case I.

A. J. Wilson.

1921

A CASE OF PENILE HYPOSPADIAS.

Daniel M. Aet 8. Schoolboy.

Admitted:- 18th May 1920. Ward 7.

Readmitted:- 22nd November 1920.

Diagnosis:- Penile Hypospadias.

Patient's Complaint:- Patient was sent in for advice on account of a deficiency in the floor of the urethra.

History of present disease:- The condition has been present since birth, and gives no trouble. The patient has good control of micturition, but tends to wet his clothes. Previous unsuccessful operations have been undertaken to cure the condition.

Family History:- Father and mother alive and well. One elder brother suffered from the same condition and was treated in the R.I.E.

Physical/

Physical Examination (May 1920).

Examination of the penis revealed the presence of a penile hypospadias, the termination of the urethra being at the peno-scrotal junction, the urethra being deficient along its floor and its lateral walls hanging over the canal as an imperfectly formed tunnel. The fraenum of the prepuce was absent and the imperfectly developed prepuce overhung the dorsal aspect of the glans like a hood. The penis was curved with its concavity downwards, and could be forcibly straightened so that there was little development of scar-tissue.

The patient was otherwise a healthy boy.

Chest-symmetrical.

No cough.

No dulness.

Heart not enlarged.

Heart sounds closed and well heard in all areas.

Operation:-

The Bucknall Operation was the one chosen, and was done by Prof. Sir Harold J. Stiles in 2 stages.

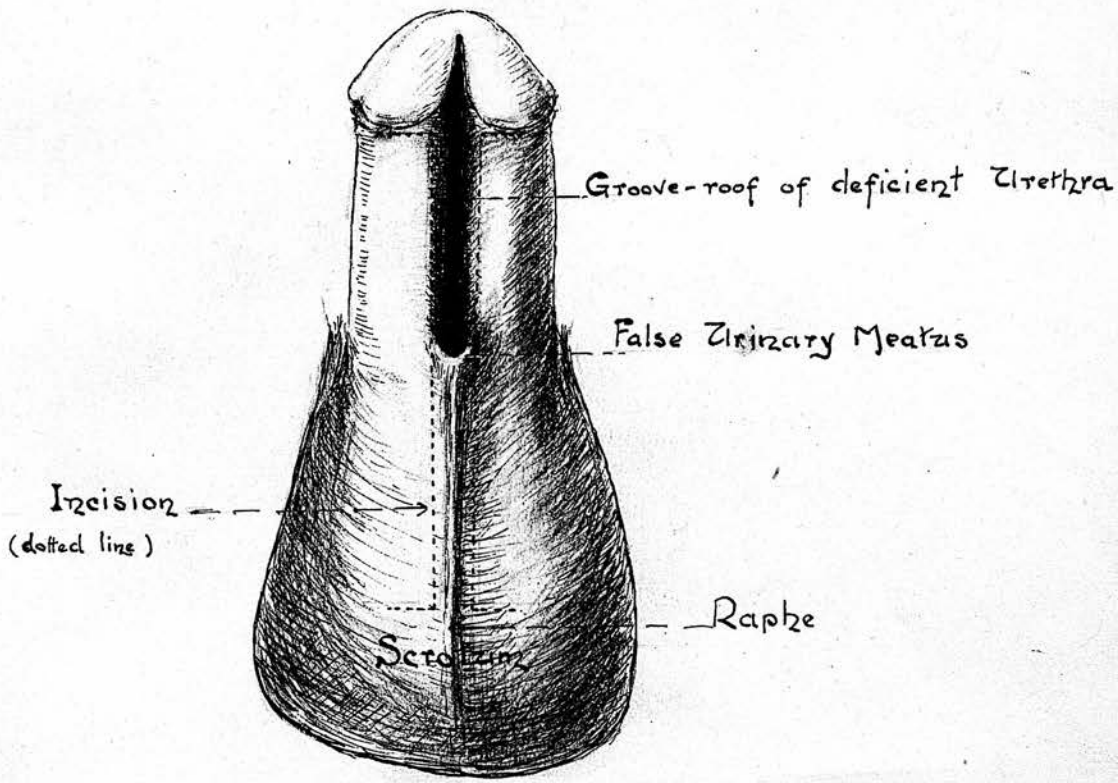
1st Stage - 9th June 1920.

2nd Stage - 26th November 1920.

1ST STAGE.

The object of this stage is to reconstruct the deficiency in the urethral floor.

(1) To facilitate the incisions the penis was drawn up over the abdomen in the midline, and the scrotum down in the opposite direction between the thighs, so that the groove on the under surface of the penis (representing the roof of the deficient urethra), the false urinary meatus and the scrotal raphe all occupied the middle line (See diagram)

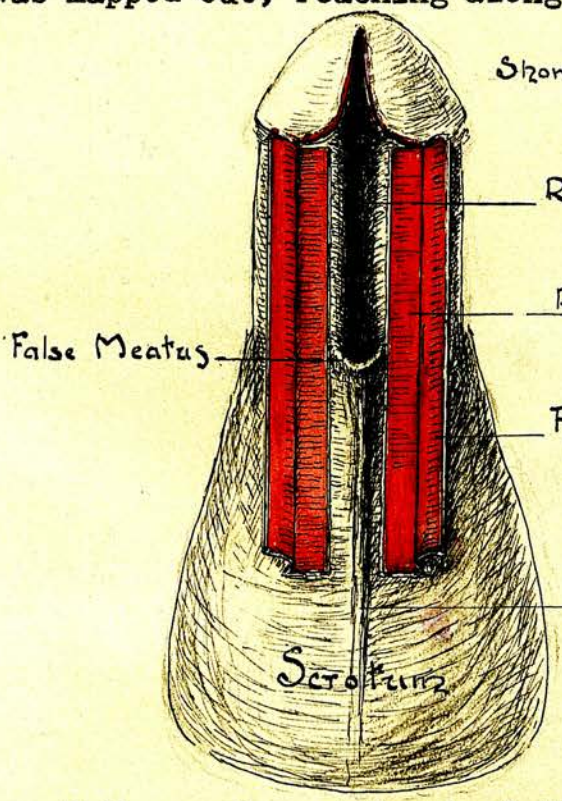


— Diagram 1 —

(2) A small catheter was now passed into the urethra through the abnormal meatus and two incisions were made on each side of the mid-line of the penis, ¼" from it and parallel to it. These incisions started at the reflection of the skin onto the glans and were continued onto the front of the scrotum, (parallel to the raphe) until the incisions in the scrotum measured from the level of the misplaced urethra were equal in length to those on the penis from meatus forwards. (See Diagram on Page 3).

(3) When these incisions were completed a medial strip of skin was mapped out, reaching along the upturned ventral

Diagram 2
Showing flaps dissected up and everted

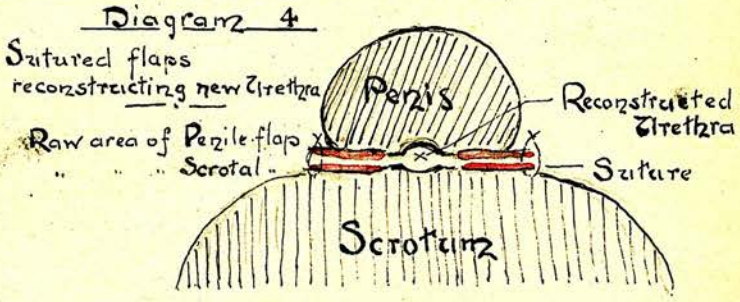


surface of the penis and front of the scrotum with the misplaced urethra at the centre. From the extremities of the/

the two incisions bounding this strip of skin others were made outwards at right angles each about ¼" in length. In this way two longitudinal flaps were marked out on either side of the median strip of skin throughout its whole length. These flaps were then dissected off the sides of the penis and front of scrotum respectively and rolled outwards away from the middle line throughout their entire length.

(4) Two longitudinal strips, each presenting a raw surface, were thus produced on either side of the median strip of skin previously referred to, which was left undisturbed (see Diagram on Page 4). The flaps were held in the everted position throughout the entire length, and while in this

Diagram 4



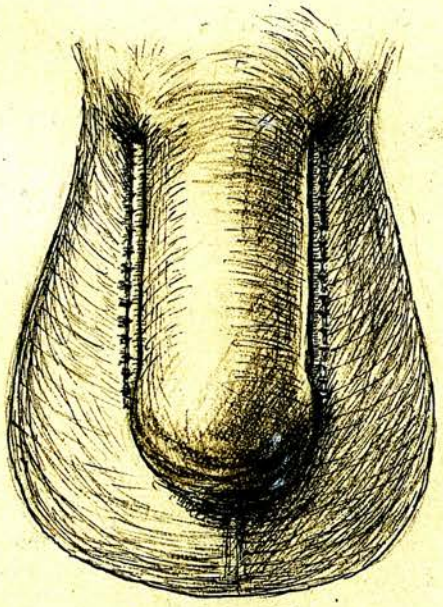
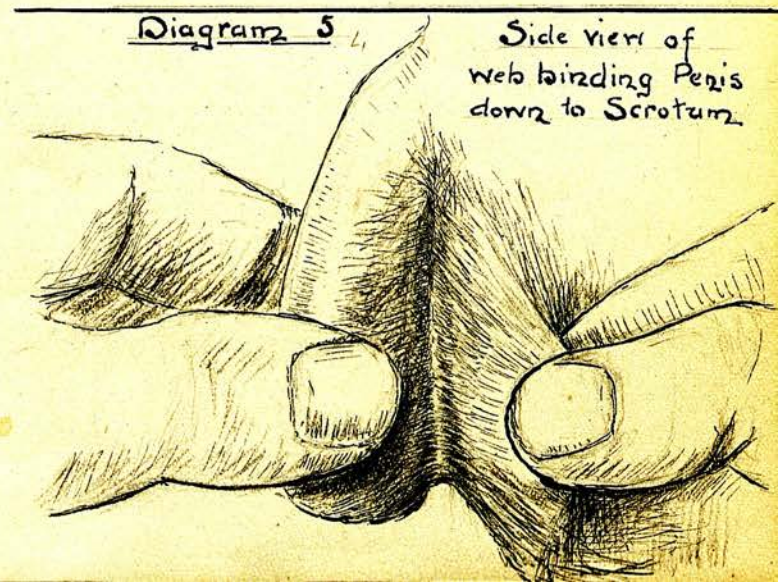


Diagram 3
Penis flexed on to Scrotum with flaps everted

Diagram 5

Side view of web binding Penis down to Scrotum



position the penis was flexed down onto the scrotum in the middle line about a transverse axis passing through the misplaced urinary meatus. The medial strip of skin on the ventral aspect of the penis and the raw areas flanking it thus come to lie on the corresponding medial strip and raw surfaces on the front of the scrotum. The penile strip of skin will form a roof for the new urethra and the scrotal strip will form its floor. The mucous membrane of the glans as it formed the lateral borders of the deficient glandular urethra, was then rawed longitudinally along the proximal margin on each side (see diagram 2). The raw surfaces on the penis and scrotum on each side when properly sutured together (and to the raw edges of the glandular mucous membrane) thus fixed the penis to the scrotum, and closed in the new urethral tube, rendering it water-tight (see diagrams 3 & 4). Before suturing, the edges of the mobilised flaps were trimmed down, so as to avoid a wide flange of skin projecting on each side.

2ND STAGE. 26.11.20.

On Examination.

The penis is very diminutive for a boy of the patient's age. The organ lies on the front of the scrotum in the middle line, and on attempting to elevate it a web of skin stretches from the scrotum to the urinary meatus. The latter is situated just at the corono-penile junction on the ventral surface. The orifice of the meatus is quite patent and there is no stenosis, and when the boy micturates there is no leak. Along the lateral margin of the penis, just where it is bound down to the scrotum there are old operation scars (sutures). The glans penis is cleft along its ventral surface by a deep groove which runs forwards to the tip of the glans from the meatus in the axis of continuity of the urethra. There is no fraenum present, while the prepuce on the dorsal surface is tremendously overgrown, overhanging the glans like the cowl of a monk's head-gear.

Operation. The object of this stage is to dissect up the penis from the scrotum, and thus remove the web of skin binding the two.

(1) A small catheter was inserted into the urethra and the skin of the penis and scrotum was made taut by threads passed through. Incisions were then made in the skin of the scrotum parallel to the lateral borders of the penis and about $\frac{1}{3}$ " distant (see dotted lines in diagram below). Transverse incisions at right angles to these were then made from the perineal extremity towards the middle line.

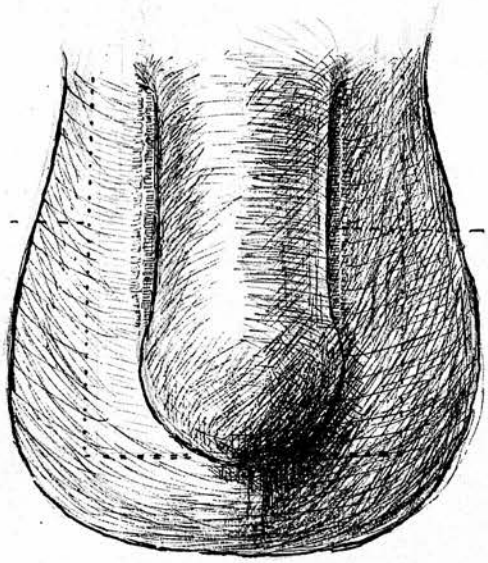


Diagram 6.

(2) The penis was now carefully dissected up off the scrotum, lateral flaps derived from the scrotum being left attached on either side of the penis to close in the raw surface/

surface beneath it. The upper (distal) ends of these flaps were trimmed down and then the flaps were approximated towards the middle line and there sewn with thinnest silk work gut from above downwards, the sutures being cut seriatim in that order. The edges of the incision in the scrotum

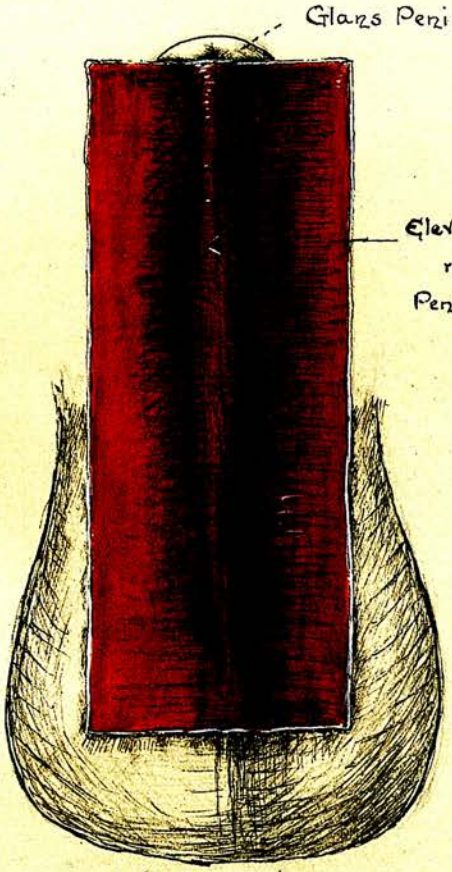


Diagram 7

Penis raised up from Scrotum Skin flaps dissected out.

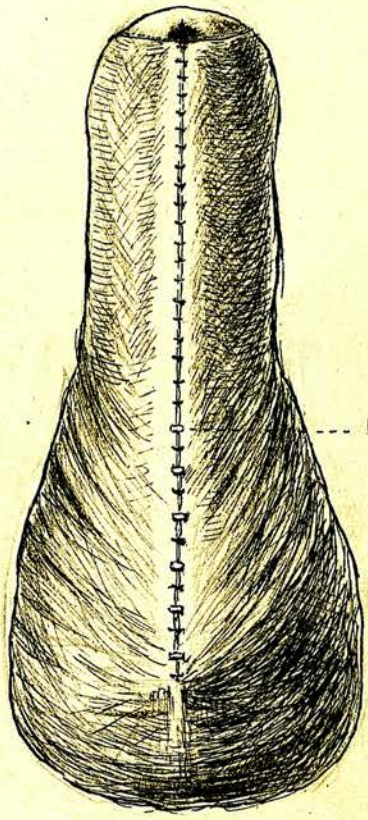


Diagram 8

Raw surfaces closed. Operation completed.

were similarly approximated to cover in the large raw area left on the scrotum left after the dissection off of the penis.

The edges were fixed partly by silk-worm gut sutures and partly by Michel clips.

The catheter was now removed from the urethra; just a little iodoform paste was applied along the line of the sutures and dry gauze was applied over the wound. Lastly the whole of the penis and scrotum were enclosed and protected by an old Schimmelbusch anaesthetic-frame, which was retained in position by a bandage.

Progress Notes:-

28.11.20. Wound examined and everything dry. No discharge except a little sero-sanguineous fluid. No pain. No temperature.

1.12.20. Wound dressed.

4.12.20. Wound dressed. Edges completely united.

7.12.20. Stitches removed. Patient was able to pass water standing erect. The stream was good and there was no tendency for the urine to trickle down and wet the clothes, as before the operation.

8.12.20. Patient discharged in perfect health and completely recovered.

8.5.21. Patient shown by Sir H. Stiles at meeting of British Association of Surgeons. The boy was able to pass water just like a normal individual and there was no tendency to soiling the trousers.

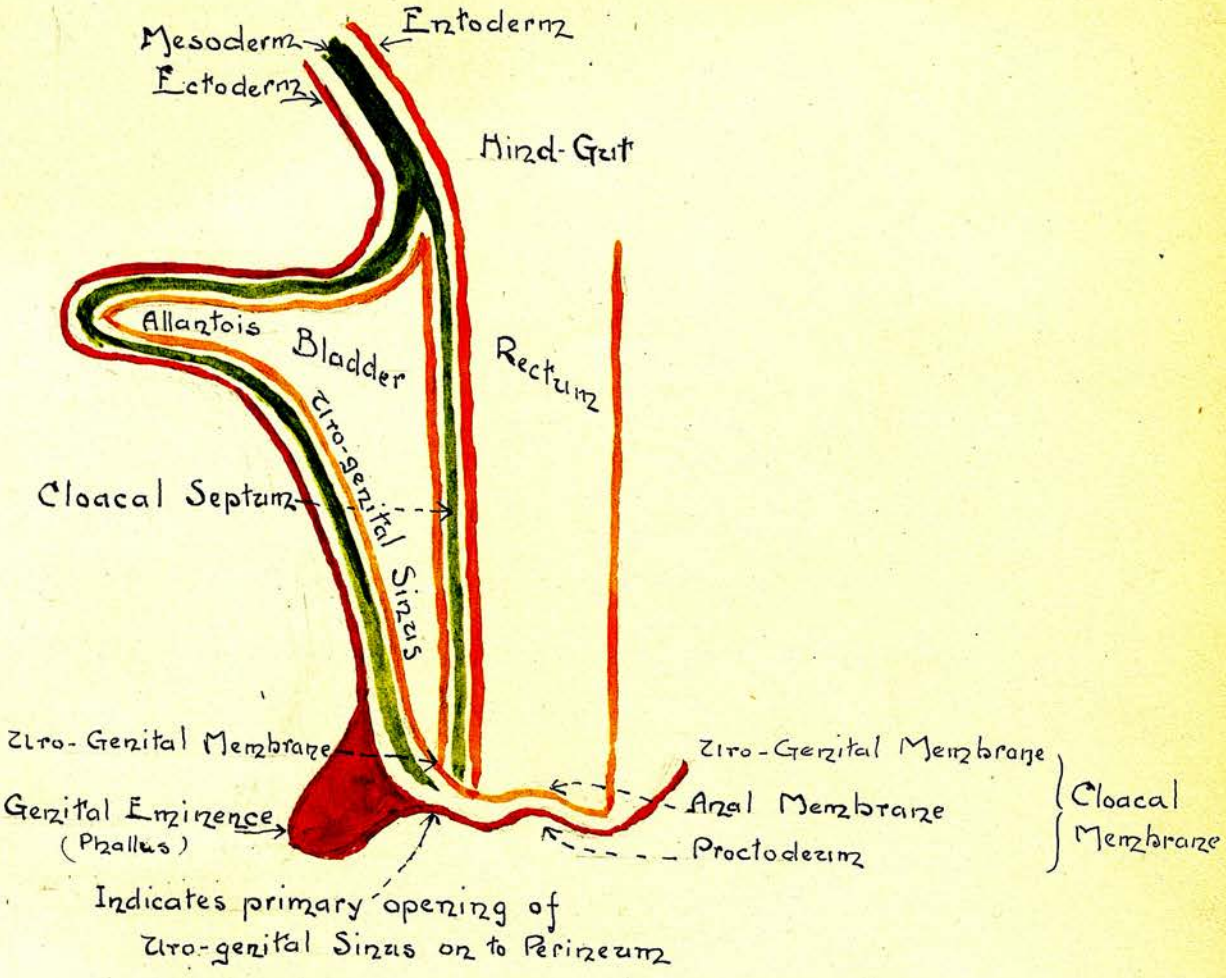
C O M M E N T A R Y.

Pathology of Hypospadias.

To complete the record of the case it would be of interest to consider briefly the nature of the developmental errors in the embryology of the uro-genital apparatus which result in the condition of hypospadias.

The part of the embryonic hind gut caudal to the origin of the allantois is known as the Cloaca and early in development this becomes subdivided into a dorsal portion and a ventral portion by a Cloacal Septum which extends caudally to be attached to the ventral wall of the Cloaca at the Cloacal Membrane - a region where the entoderm and ectoderm lie in apposition, no mesoderm intervening.

The cloacal membrane is thus divided into 2 portions, viz. a caudal part - the Anal Membrane which bounds the caudal end of the dorsal half of the cloacal cavity and a cephalic part - the Uro-Genital Membrane which similarly bounds the caudal end of the ventral half of the cloacal cavity.



The dorsal half of the cloacal cavity gives rise to the rectum and colon and early in development the anal membrane breaks down, thus opening the rectum into an ecto-dermal depression on the surface - the Proctodeum.
The ventral half of the cloacal cavity is differentiated into a dilated upper part which (with the allantois) forms the bladder and a lower portion which is termed the Uro-Genital Sinus. Early in development the Uro-Genital membrane similarly/

similarly breaks down and the bladder thus opens on the surface of the perineum just in front of the anus.
At the cephalic end of the cloacal membrane there develops an ectodermal elevation - the Genital Eminence which in the male forms the phallus, and in the female the clitoris. Before the uro-genital membrane breaks down, the uro-genital sinus extends forwards under the genital eminence, so after rupture, the bladder opens not only on the perineum but also on the caudal aspect of the base of the phallus. As the latter rapidly grows to form the penis, the sinus extends forwards along the caudal aspect of the organ, grooving it - Uro-Genital Groove, and pari passu the opening on the perineum closes.

During these changes there develops on either side of the genital eminence a Genital Fold the caudal halves of which extend backwards toward the anal region, where uniting with a Perineal Body in front of the anus form the 2 halves of the scrotum in the male and the labia majora in the female, while the cephalic halves grow forwards along the caudal surface of the developing phallus, and meeting in the middle line (raphe) convert the uro-genital groove into a canal - the penile urethra which latter tunnels the glans and opens on the meatus at the distal end.

These facts explain the varieties of Hypospadias:-

(1) In perineal hypospadias - the urethra opens on the perineum just in front of the anus - due to persistence of the primary opening of the uro-genital sinus in the perineum after the breaking down of the uro-genital membrane.

(2) Penile Hypospadias as in this case - due to the incomplete union of the genital folds on the caudal surface of the penis, resulting in failure of complete canalisation of the uro-genital groove, the urethra opening prematurely on the under surface of the penis.

A CASE OF PRIMARY OVARIAN CARCINOMA.

Case II.

A. J. Wilson.

A CASE OF PRIMARY OVARIAN CARCINOMA.

Mrs L. Aet 47. Housewife.

Admitted 15.3.21.

Patient's Complaint:- Pain in the left side and back duration 2 - 3 years.

Progressive swelling of the abdomen - 3 months.

History of the present disease.

For the last 2 - 3 years patient has been troubled with pain over the left loin and back. The pain has been more or less constant, is not affected by changes in posture, and is worst at night often interfering with sleep but never severe enough during the day to prevent performance of household duties. Latterly the pain has become more acute with severe lancinating colicky exacerbations confined mostly to the lower abdomen. These have within the last 4 - 6 weeks become so severe as to cause vomiting.

During New Year 1921 - 3 months ago - patient noticed that her abdomen began to swell and has progressively continued doing so, until recently walking became very difficult.

Previous Health.

Patient has been troubled with "indigestion" for the last 2-3 years - a sense of fullness in the epigastrium and discomfort even amounting to pain, coming on at an indefinite time after the taking of food. There has never been any vomiting associated with this and the bowels have been freely open.

During the last 3 months, patient has lost weight very rapidly and easily becomes exhausted.

Prior to the onset of this illness patient was in quite good health.

There is nothing in the family history of note.

Reproductive History.

Menstruation began at the age of 13 years, and the menopause occurred early - 35 years. There has been no reappearance of haemorrhagic discharge since the change of life.

2 children, aet 25 and 17. Both instrumental deliveries.

Physical Examination.

Patient is very thin and wasted looking. There is a slight degree of anaemia but no definite cachexia. On inspection the abdomen is markedly and uniformly distended. The veins of the abdominal wall are dilated and the skin is glazed/

glazed. Respiration is mainly thoracic.

On Palpation:- Fluctuation is easily obtained. The distension of the peritoneal cavity is so great that none of the viscera are palpable and no solid tumour could be detected anywhere. There is no tenderness on deep palpation beyond a certain amount of resistance over an area mentioned below.

On examination of the sensory functions of the skin cutaneous hyperalgesia was found all over the lower half of the abdomen, extending as a horizontal band spreading forward from between the 1st to 3rd lumbar spines behind, round the body with its upper limit in front at the umbilicus. This zone therefore corresponds to the "root-area" of the 10th dorsal nerve. The hyperalgesia in this band was more marked on the left side, notably over an area slightly below the umbilicus and about 2" to the left of the mid-line. On picking up the skin of this region pain was felt in the area picked up and also over a corresponding area on the other side, but the pain felt immediately diffused out and spread equally all over the anterior abdominal wall below the umbilicus.

On percussion, the abdomen gave a dull note all over, least so over the centre of the protuberent wall.

Auscultation was negative.

Vaginal/

Vaginal Examination. (Bimanual)

In the posterior fornix there is a bulging mass, hard in consistence, nodular, not ulcerated but quite immobile. It is not tender on pressure. With the finger in the anterior fornix, the body of the uterus cannot be made out owing to the distension of the abdominal cavity and it is therefore impossible to say whether this tumour mass is, or is not, connected with the uterus. Nothing very obvious can be felt in the lateral fornices, except a greater fullness and obliteration than normally.

The cervix uteri is of normal consistence but quite fixed and immobile.

Rectal Examination.

With the finger, a hard, nodular, irregular mass can be felt high up, lying in front of the anterior rectal wall, which is intact over it. The mass extends upwards beyond the reach of the finger and outwards on each side for over an inch. It is absolutely fixed.

Provisional Diagnosis:- Pelvic Neoplasm.

Operation. (22.3.21.)

Patient was placed in the Trendelenburg position and a mid-line incision made from the umbilicus to near the symphysis pubis. The incision went down through skin and fascia direct/

direct onto the fascia transversalis - the recti having become divergent from the increased intra-abdominal pressure - and the bulging parietal peritoneum presented. This was caught between catch forceps and carefully incised, and immediately there welled out a large quantity of clear amber-coloured, odourless fluid. The incision into the parietal peritoneum was then extended with scissors. On passing the hand into the pelvis 2 large, hard, nodular, friable, irregular fixed masses were found in the position of the ovaries, that of the left side being the larger. The remainder of the pelvis, especially the Pouch of Douglas, was filled up with secondary growth. The Fallopian tubes were indurated and thickened, and the broad ligaments infiltrated with nodular masses. The parietal peritoneum, both pelvic and abdominal was studded with numerous small white nodules, and a portion of it was excised for microscopic examination. The omentum and the mesenteries (of the small gut and both mesocolon and pelvic colon) were thickly infiltrated with metastatic growth forming hard plaques of tissue. The lumbar glands along the aorta were also enlarged and indurated, but no secondary growth could be found in the liver.

The alimentary tract was then systematically examined commencing at the stomach and proceeding downwards through the small and then the large intestine as far as the rectum, but there was no growth found anywhere. The gall-bladder and its vicinity/

vicinity appeared quite healthy.

The extensive disease completely negatived any operative treatment and so the anterior andominal wall was closed in layers, the skin edges being united with Michel clips.

Prognosis.

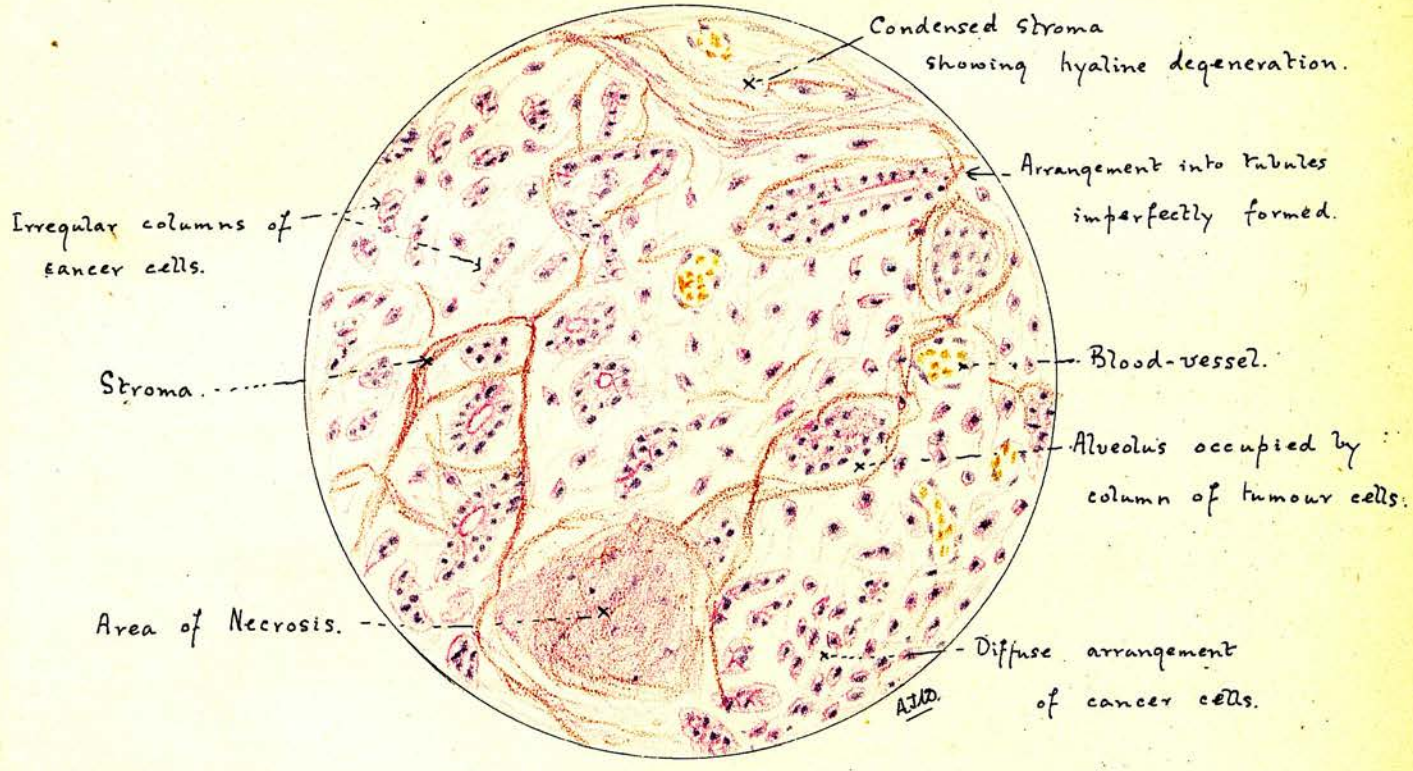
"Inoperable carcinoma of the ovaries, especially if associated with ascites, soon becomes fatal and death is only a matter of time". (Bland-Sutton).

Progress Notes.

Patient made a satisfactory recovery from the operation but the abdomen was filling again with fluid, slowly but steadily. She was allowed home on 11.4.21, prior to removal to Longmore Hospital.

Pathological Report.

The preparation is a section of the secondary nodule removed from the parietal peritoneum, and shows the presence of a malignant epithelial neoplasm. The cancer cells are arranged differently in different parts of the section but generally speaking, two types of grouping can be made out.



Section of a secondary nodule in the parietal Peritoneum.

(1) Alveolar type - in which the cancer cells are arranged in irregular columns or imperfectly formed tubules, and are lying in spaces of round or oval shape, enclosed by trabeculae of connective tissue stroma, which is relatively abundant and shows oedematous infiltration and advanced hyaline degeneration.

(2)/

(2) Diffuse type. Here the cells are scattered indiscriminately throughout the stroma, not evenly, and without any attempt at limitation or confinement in spaces.

On the whole the tendency is more towards an alveolar than a diffuse arrangement.

COMMENTARY.

The interest of the present case is entirely pathological, as the pathology of ovarian neoplasia is obscure and there is by no means unanimity among the authorities on the subject.

Carcinoma may occur in the ovary under conditions which may be stated as follows:-

(1) As a primary growth.

(2) As a malignant transformation of a previously existing benign ovarian tumour, cystic or solid.

(3) As a secondary growth arising either by direct extension, or more often by metastasis.

Primary/

Primary Ovarian Carcinoma.

Opinion as to the frequency of this appears to be divided. Bland-Sutton states that "primary cancer of the ovary is a rare disease, and one concerning which we know little"; and Eden and Lockyer also write that "it is a comparatively rare form of tumour", and point out that "among the female organs liable to be attacked by primary cancer, the ovary stands low in order of frequency". Per contra, MacCallum maintains that "although tumours distinctly secondary to mammary, gastric, or intestinal carcinomata have been found in this organ, their occurrence is rare and most of the ovarian tumours are primary". The reasons for these differences in opinion will be referred to later.

Such primary cancers are frequently bilateral, but then so are the secondary ones, and this therefore gives little aid in distinguishing the two varieties. This feature is difficult to explain in primary cancers. Bland-Sutton thinks that a simultaneous onset of the disease in both ovaries is unlikely, and that it is more probable that one ovary is attacked by metastasis or by direct extension. This view receives some support by the fact that at the somewhat advanced period when these tumours commonly come under observation, one is usually considerably larger than the other - a point which is illustrated in the present patient.

Cancerous Metaplasia following on a Bening Ovarian Tumour.

e.g. on papillary cysts, pseudo-mucinous cysts, dermoids, corpus luteum cysts, ovarian fibromata, etc. Eden thinks that such cancerous changes in originally benign cysts are much commoner than was formerly supposed, and even goes so far as to say that "it is probable, that from a clinical standpoint, of all malignant ovarian tumours, cancerous changes in ovarian cysts are the most frequent, secondary cancerous tumours coming next, and the true primary growths last, in order of frequency."

In reference to the question of malignant changes in an ovarian tumour possibly previously present in the case under consideration, it is of interest to note the early onset of the menopause (at the age of 35). At the same time one must admit that there are few lesions of the ovaries which produce complete amenorrhoea. "Only those diseases which destroy both ovaries completely, can cause amenorrhoea" (Stevens), and Lockyer agrees "that the presence of benign ovarian tumours does not necessarily affect either of the functions of menstruation or ovulation, as even when they are bilateral, a certain amount of ovarian tissue persists."

Histologically in advanced stages, it is quite impossible to distinguish such malignant changes following upon a benign neoplasm from a true primary cancer.

Secondary/

Secondary Ovarian Cancer.

Schlagenhaufer's statistics show how frequently the ovaries are the seat of secondary cancer, especially when the disease arises primarily in the breast, gastro-intestinal tract or gall-bladder. The relation between the primary cancer and the masses in the ovary is demonstrated by the fact that the structure of the ovarian tumours varies according to the situation of the primary growth, the histological features of the secondaries closely resembling those of the primary growth. Thus it is usually possible - at least when the primary is in the alimentary tract - to demonstrate that the growth is of metastatic nature. In mammary cancer however both the alveolar and diffuse types typical of primary ovarian cancer are found in the metastatic formations and here it is impossible from microscopic evidence alone to distinguish primary ovarian cancer from metastatic growths from a mammary carcinoma.

The explanation of the modus operandi of the route by which large deposits of cancer in the ovary secondary to mammary or gastric cancer, formerly so puzzling, has now been simplified by Handley's discovery of the mode in which mammary cancer involves the abdomen. He has shown that cancer spreads by permeating the deep fascia - the cancer cells insidiously creeping along the lymphatics of the fascial plexus until they reach/

reach the epigastrium immediately below the ensiform cartilage. At this point the cancer filled lymphatics of the fascial plexus in the middle line are separated from the sub-peritoneal fat only by a layer of fibrous tissue.

Through this weak defence the cancer cells slowly find their way into the general peritoneal cavity and engraft themselves on the omentum and other suitable visceral plots, whereon they thrive and grow into metastatic nodules or lumps. Many of these infecting cells are conveyed into the pelvis and lodge on the ovary, tubes, uterus or pelvic peritoneum. The fluid normally present in the peritoneal cavity serves as an admirable vehicle for the transport of such cells, enabling them to reach the pelvic recesses, where they remain to grow into deadly lumps.

Similarly in cancer developing in any part of the alimentary tract, the neoplastic mass slowly permeates the mucous membrane and implicates the sub-mucous, muscular and peritoneal coats. The cancer cells can thus freely escape into the great serous cavity and be distributed by the fluid, aided by the movements of the bowels and gradually reach the pelvic and other abdominal recesses. In the pelvis the most obvious organs on which they could fall would be the ovaries, as they so often rest on its floor. Under such circumstances the ovaries may be fairly pictured in the mind receiving a covering of falling cancer cells like/

like evergreen shrubs are clothed by snowflakes in the winter.

Not infrequently secondary growths in the ovary attain a large size, while the primary growth in another organ remains small and gives rise to no conspicuous symptoms, and it is the presence of the ovarian tumour, or more often - as in the present case - of the accompanying ascites which attracts attention, not the primary disease. This has been confirmed post-mortem in many cases and it is for this reason that authorities differ so much as to the relative frequency of these cancers and so also the basis for Lockyer's view that the frequency of secondary ovarian cancer, as clinically met with, is probably considerably underestimated.

In the present patient the history of previous "indigestion" was suspicious, but during the operation careful investigation failed to reveal any tumour, and this together with the histological structure of the cancer, compels one to incline towards a diagnosis of Primary Ovarian Carcinoma.

As to the exact elements in the ovaries from which a primary carcinomatous tumour might arise, there is a difference of opinion. Fothergill and others are of the opinion that the tumours often arise from a Graeffian Follicle, because of the occasional presence in the tumour of large vesicular egg-like cells,/

cells, with a nucleus resembling the germinal vesicle. Some authorities ascribe their origin to the cells of the membrana granulosa (Griffiths), while others suggest an origin from Pflüger's cords. Most pathologists, however, including MacCallum and Lockyer think that the tumour arises most commonly from the germinal epithelium which growing down in gland like invaginations into the stroma, becomes cut off, the epithelial cells undergoing irregular and atypical proliferation and invading the surrounding tissue.

The dissemination in the present case affords some points of anatomical and pathological interest:-

Dissemination might conceivably occur in 4 different ways:-
(1) By direct extension. (2) by lymphatic infection.
(3) By peritoneal implantation of liberated cancer cells.
(4) By the passage of liberated cancer cells into the tubes.

Lymphatic extension follows much the same line as in the case of cancer of the uterine body and this accounts in the present case for the involvement first of the broad ligaments and pelvic glands, and later of the mesenteric and lateral lumbar glands.

Peritoneal infection do not occur while the fibrous capsule of the tumour remains intact; this capsule however in the present patient had become perforated by cancerous outgrowths.

Cancer/

Cancer cells are thus set free to infect the peritoneal membrane, either in the neighbourhood, or when conveyed thither by peritoneal currents, in distant parts. This is the explanation in the present case of the formation of the large masses of nodular growth in the peritoneum in the upper part of the abdomen.

The involvement of the tubes may be explained, in addition to spread by direct extension and by spread along the peri-vascular tubal lymphatics, by cancer cells being conveyed into the tube and being carried onwards by the ciliary action of the tubal mucosa. Glendinning recently has shown that tubal infection may also occur by the passage of clusters of cancerous cells from the peritoneal cavity through the tubal wall into the sub-epithelial connective tissue, giving rise to secondary growths in that position.

Having thus briefly considered the pathology of the present case, one may now pass on to inquire into the chief symptoms of which the patient complained, viz. pain.

The actual cause of pain from an ovary, the site of a malignant growth, may be due to:-

(1) Increased pressure from an increased cell-production.

(2) Structural changes in the nerves supplying the organ, by infiltration of the fibres by the tumour cells.

(3)/

(3) By the action of the toxins of the malignant process upon the incorporated terminal sensory filaments.

All the above being aided in woman of neurotic temperament by functional changes in the nerves, by which sensibility is greatly increased.

The pain, it will be recalled, was more or less constant, and was situated over the back behind and low down on the left side in front, and latterly had become more acute with severe colicky pains which were even so extreme as to cause vomiting. It will also be remembered that there was found on examination a horizontal zone of cutaneous hyperalgesia limited above in front by the umbilicus and bounded behind by the 1st to 3rd lumbar spines, i.e. the 10th dorsal nerve "root-area"; further that there was a specially sensitive hyperalgesic area in this zone at a point on the left side below and 2 inches to the left of the umbilicus.

The explanation of these phenomena is as follows:-

Mackenzie has shown that the abdominal and pelvic viscera are themselves quite insensitive to touch or pain, and that pain resulting from a lesion of a viscus is felt, not <u>in</u> that viscus itself, but is reflexly referred to the peripheral distribution of the spinal nerves arising from those segments of the cord with which that viscus is connected through its sympathetic nerve/

nerve-supply. Since the abdominal wall is supplied by the lower 6 dorsal nerves, and the abdominal and pelvic viscera are connected via the sympathetic with those same nerves, it follows that pain arising from a diseased state of a pelvic or abdominal viscus, is referred to the peripheral distribution of the corresponding dorsal nerve, i.e. to the mid-line of the anterior abdominal wall.

The question is then, what is the corresponding dorsal nerve in the case of the viscus under consideration, viz. the ovary. Now, although neurologists are not unanimous on the point, it is generally agreed that the nerve-supply of the ovary is derived from sympathetic fibres which enter the cord at the 10th dorsal segment. So that, in a case of ovarian disease the pain should be referred to the peripheral distribution of the 10th dorsal nerve, in the mid-abdominal line. In the present patient, however, pain was complained of, not in the mid-abdominal line but in the left side and back. The explanation of this is that the dorsal nerves have both posterior and lateral branches in addition to their anterior terminal branches, so that the referred pain may be felt in the back and one side of the abdomen, as well as, or - as in the present patient - instead of, the middle line anteriorly.

Coming now to the cutaneous hyperalgesia:- In health, impulses are constantly passing both in an afferent direction from the viscera to the spinal cord and efferently ~~from~~ to the skin and muscles of the abdominal wall without our being aware of their existence. If a viscus becomes diseased the afferent impulses will naturally be of a more irritant nature, and the segment or segments of the cord receiving those impulses will be in a state of hyper-excitability. If a cutaneous nerve connected with one of these hyper-excitable segments receive a stimulus - such as a light pinch, which normally would have been quite insufficient to evoke any sense of pain, and which applied elsewhere to the body would fail to do so - it is very probable that pain will be felt; that is the area of skin pinched is said to be hyperalgesic. Thus, the excitability of the 10th spinal segment in ovarian disease, owing to the irritant nature of the impulses reaching this segment from the diseased organ via the sympathetic, is so great, that the whole cutaneous distribution of the spinal nerve issuing from that segment is hyperalgesic. This is the explanation of the horizontal zone of hyperalgesia found, the zone corresponding to the cutaneous distribution of the 10th dorsal nerve.

Note was made that one region in this zone was specially hyper-sensitive, viz. an area on the left side, slightly below the/

the umbilicus and about 2" out from it. This lies over the point where the lateral cutaneous branch of the 10th dorsal nerve becomes superficial (Behan), and the more marked hyperalgesia found here is probably due to the exposed position of this cutaneous filament at this point, so that pressure is more easily exerted upon the 10th nerve here than elsewhere.

The situation of referred ovarian pain on the left side, irrespective of the localisation of the lesion which for instance in the present patient is bilateral, is a phenomena clinically well-known, but not so easy to explain. Hermann ascribes it to the fact that the left side is weaker and less resistent than the right, while Clark thinks it may be explained as being due to the tension of the tightly drawn left mesovarium over the brim of the pelvis. It may in some cases be partially explained by the fact that on the left side (in hysterically inclined patients) there is usually a hysterical zone in this ovarian region.

During the last 2 months patient had complained of acute exacerbations in the abdominal pain, colicky in nature and often terminating in vomiting. The explanation of this is rather difficult, but the following theoretical explanation may be offered. It is conceivable that the hyper-excitability of the 10th dorsal segment, as a result of the increased irritative nature/

nature of the impulses arriving there via the sympathetic from the diseased ovary, has become so intensified that an overflow might occur into other sympathetic fibres entering this segment from the other abdominal viscera. Now amongst these fibres are a number coming from the small intestine, which are motor to the sphincters - pyloric and ileo-caecal. Reflected irritant efferent impulses passing along there would thus cause a spasm in these sphincter muscles - resulting in the ileo-caecal spasms in a colicky pain, and in the pyloric possibly vomiting. This mechanism would be analogous to that of Mackenzie's "viscero-motor" reflex, involving instead of voluntary striped muscle, the non-striped visceral muscle of the gut.

Behan in his book on "Pain" has suggested another explanation which differs somewhat from that offered above. He points out that the sympathetic fibres supplying the ovary are derived from a plexus surrounding the ovarian artery, and that this plexus in turn is formed of nerves from the renal and aortic plexi, which are in intimate connection with the abdominal sympathetic. Now the constant irritation from a lesion of the ovary produces abnormal excitability to stimulation, not only in the sympathetic nerve-endings in the viscus itself, but also in the sympathetic nerves and nerve plexi which supply it. This excitability, in turn, is communicated, by the sympathetic communications mentioned above, to the adjacent centres supplying the intestines, which/

which are thus thrown into a state of pathological hyper-excitability. When they are in this condition stimuli, which ordinarily would produce no reaction, cause pain, or else may reflexly produce spasms of the bowel, and these in turn cause the pain.

A CASE OF ADENO-CARCINOMA PYLORI.

Case III.

A. J. Wilson.

A CASE OF ADENO-CARCINOMA PYLORI.

John S. Age 73. Retired Baker.

Admitted to Prof. Meakin's Ward on 20.11.20.
Transferred to Prof. Sir. H. Stiles' Ward on 7.12.20

Complaint.

(1) Pain in the epigastrium - duration 3 months.

(2) Constipation and pain on defaecation - duration 2 years.

History of Illness.

Patient's first trouble came on about 2 years ago when he began to notice that he had pain on defaecation. It appeared to come from near the anus and was lancinating in character, so that he avoided going to stool. He then suffered from extreme constipation and went into a nursing home where he was treated with olive-oil enemata. Since then patient has always had a tendency to constipation but the bowels always moved with medicine.

About 6 months ago constipation became extreme and this increased until 3 months ago when he developed alternations of constipation and diarrhoea. Sometimes there was a slight trace/

trace of blood in the stools which patient ascribed to piles. There was no mucus.

Three months ago patient began to complain of dull constant pain in the epigastrium. Some days this pain was worse than others and altered with his posture, - it is least felt when lying on the left side or back and is worst when lying on the right side - so much so that patient could not sleep when lying on the right side. The taking of food especially meats, made the pain much worse, the increase in pain coming on about 20 minutes after food. He never vomited but if he took solid food it came straight back, and he occasionally noticed bits of the previous day's meals in the returned matter. Patient was also troubled with foul eructations, flatulence (upwards), and a sour taste in his mouth in the mornings. He lost 2 stone in weight in 3 weeks and has progressively been getting thinner and weaker. His appetite is very poor and he feels no inclination to eat.

Previous Illnesses.

Previous to the onset of the present trouble patient has been quite healthy and has never at any period previously had digestive disturbance of any kind.

Physical/

Physical Examination.

Patient is extremely anaemic and thin, and has a slightly yellowish tinge in the skin.

On inspection, the skin of the abdominal wall is loose and can be lifted up in big folds, - there is little subcutaneous fat. The abdominal wall moves equally on respiration. Above the umbilicus it appears rather fuller than usual.

On palpation splashing was elicited 6 hrs. after food. In the epigastrium about 3 c.m. above the umbilicus there was felt a distinct hard rounded swelling about the size of a walnut which was lying transversely and moved with respiration. It was freely movable, and slipped away from the palpating finger with a sudden jerk. Pain was felt over it on pressure.

The sigmoid flexure could be distinctly felt but no pain was elicited on palpating it, nor was there pain elsewhere in the abdomen. The spleen and kidneys were not enlarged.

On percussion the stomach was found to be greatly enlarged and in the recumbent posture descended to the level of the umbilicus. There was no enlargement of the hepatic dulness and no enlarged supra-clavicular glands.

Rectal/

Rectal Examination.

This was very painful. This was due to the presence of a small fissure in ano which accounts for the painful defaecation. At the upper limit to which the finger could reach there was a ring-like spasm of the muscle, which was painful to touch.

Radiographical Evidence.

Opaque meal:- 1st meal - trace of gastric stasis with the remainder in the proximal part of the caecum with traces beyond. 2nd meal - showed a low J shaped stomach with ill defined pylorus, in fact no cap was visible and no peristalsis; although the tone of the stomach was fair, it kept the meal suspended for quite a long time, gradually relaxing. Under continued observation no irregularity of the greater curvature was visible.

2nd day:- Want of definition of gastric region but still a trace of gastric stasis - not seen in the plate because of movement - the large bowel was unevenly filled.

3rd day:- Distal colon well and evenly filled.

An/

An important point brought out by the X-rays was that the stomach, when full, was drawn over to the right. This is important and will be referred to later.

Bismuth enema:- The enema appeared to have been injected only as far as the splenic flexure and the calibre of the iliac colon seemed somewhat diminished.

Radiographical evidence therefore only shows a certain irregularity in the limit of the stomach shadow towards the pylorus, a certain obliteration of the pyloric area, and delay in the passage of the food. These signs together with the existence of a large dilated stomach suggest a pyloric obstruction, but as to the exact nature of the latter no definite conclusion could, as yet, be come to.

Haemopoietic System:- A blood examination was carried out to determine the nature of the marked anaemia.

Erythrocytes	3,630,000
Leucocytes	7,600
Haemoglobin	58%
Colour Index	.8.

Differential/

Differential Diagnosis.

The clinical examination has established beyond much doubt the presence of an obstructing element in the region of the pylorus, but the all important question from the point of view of treatment is what is the nature of this obstruction. The thing which first suggests itself to one is a new growth. But clinical experience has demonstrated that in not a few cases of pyloric obstruction, the obstructing factor is not a neoplasm - in the usual sense of the word - but cicatricial contraction in inflammatory deposits round an old healed gastric ulcer (analogous to the inflammatory matting in Tuberculosis of the Ileo-caecal region which similarly often simulates malignant growth) and from the point of view of prognosis as well as treatment it is essential to determine to which of the two causes, the stenosis is due.

Points in favour of Carcinoma.

(a) The history of pain and "indigestion" beginning abruptly in a man over 40, and the complete absence of any previous digestive disturbance or symptoms suggestive of ulcer. (though the possibility of "latent" ulcer has to be kept in mind).

(b)/

(b) Steady progressive loss of weight, with early anaemia. This latter is so often present in gastric cancer and simulates Pernicious Anaemia so closely that in the absence of a tumour differential diagnosis may be difficult. In cancer however the red cells are rarely below 2,000,000, while in Pernicious Anaemia they go much lower than that. Also in Pernicious Anaemia the Colour Index is about 1 or above it, in carcinoma it is less than 1, - in the present case .8.

(c) Loss of appetite and especially a disinclination for meat are suggestive signs.

Points against Carcinoma.

(a) Negative points are:- the free mobility of the tumour, no enlargement of supra-clavicular glands, or increase in liver dulness.

(b) X-Rays. In carcinoma the pylorus usually contracts adhesions so that it is not drawn over to the right when the stomach is full, as occurs in cases of ulcerative stenosis. In the latter there is a tendency for the pylorus to be dragged some distance to the right whereas in cancerous stenosis the whole of the filled/

filled portion of the stomach lies in the left half of the abdomen. If the cancer develops slowly and there are no adhesions (as determined clinically in the present case) the only suggestion of cancer is derived from the irregular limitation of the stomach shadow towards the pylorus, and on this ground malignancy in the present case is to be suspected. Apart from this not even the skiagram gives us much help in the differential diagnosis.

The Operation.

Performed by Prof. Sir Harold Stiles on 10.12.20.

Anaesthetic:- chloroform and ether.

Owing to the weak state of the patient, his anaemia, age and the severity of the operation to be done, saline was given subcutaneously into the axilla from the outset.

Incision:- mid-line incision from below Xiphoid Cartilage to within 1" of umbilicus, the skin, subcutaneous fat and linea alba being cut seriatim. The transversalis fascia and underlying peritoneum were then picked up between 2 catch forceps and the peritoneal cavity opened by carefully cutting between them. The stomach was next brought out and the pylorus was found to be uniformly thickened into a firm hard tumour mass about size of a small hen-egg, which stenosed the pyloric canal/

canal, and which extended on to the posterior wall of the stomach almost down to the level of the lesser curvature. The peritoneum over it was quite intact - there was no ulceration - and the whole tumour was freely movable - there were no adhesions. The glands along the lesser and greater curvatures were then palpated and found not to be enlarged and certainly not indurated. No sub-pyloric glands were seen. There were no nodules in the liver and nothing abnormal in the pelvis.

The free mobility of such a large tumour, the absence of adhesions and especially of enlarged indurated glands or metastatic growths in the liver at once seemed to contra-indicate a carcinoma. It was therefore taken that the condition was an old ulcer and was eminently a case suitable for complete resection (pylorectomy). Further, even if the case was malignant this would be the required treatment. The weak condition of the patient however questioned the advisability of this procedure for the present and a gastro-enterostomy was therefore decided upon.

The first step was to identify the duodeno-jejunal flexure and the first few inches of the jejunum. This was done by turning up the great omentum and transverse colon until the mesocolon was taut and then passing the hand to the left below the/

the attachment of the latter to the pancreas. The first coil of the jejunum is found immediately below the attachment of the mesocolon at its left extremity. On pulling on this the fixed attachment part is the duodeno-jejunal flexure.
A small opening was then made in the great omentum below the gastro-epiploic vessels, the left hand being placed in the lesser sac, and another small opening was made to the left of the mid-colic artery through the transverse mesocolon.
The first loop of jejunum was then passed through the opening in the mesocolon into the lesser sac and then out through the opening in the great omentum, the gut being maintained in its original direction, any twisting in its long axis being carefully avoided. The postero-inferior surface of the stomach was then turned out through the omental aperture and the most dependant part of the posterior surface of the stomach near the greater curvature was chosen as the site of anastomosis.
The 2 viscera were then clamped - the jejunum by a long intestinal clamp in its long axis and the stomach by Carwarden's clamp obliquely along the site chosen. The clamps were next approximated and tied with tape at the assistant's end, after which the transverse mesocolon and transverse colon and the greater part of the stomach were returned to the abdomen and the area of operation closed off by bilroth and towels.

The/

The advantages of this method, which is that introduced by Prof. Sir Harold Stiles, are:-

(1) The union of the proximal part of the jejunum to the stomach without any loop is rarely followed by the formation of kinks or spurs, as the original direction and position of the first coil of the jejunum (which is directed to the left) are preserved, the anastomosis being anti-peristaltic.

(2) While the anastomosis is being carried out, all the viscera except those concerned, are within the abdominal cavity and the risk of contaminating them is much reduced. Further, both hands of the assistant are left free.

The anastomosis was now began. The adjoining peritoneal surfaces of the organs were united by a continuous sero-muscular posterior serous suture of linen, taking a bigger bite of the stomach than of jejunum. An incision was now made in the jejunum leaving a good $\frac{1}{8}$" on each side, and then one in the stomach parallel to the last but allowing a bigger margin between the edge of the stomach incision and the serous suture than in the jejunal. The contents of the viscera were now mopped up with small pieces of gauze held in forceps. Next a continuous through-and-through suture was placed uniting the two medial edges of the anastomosis. The anterior serous suture was then tied/

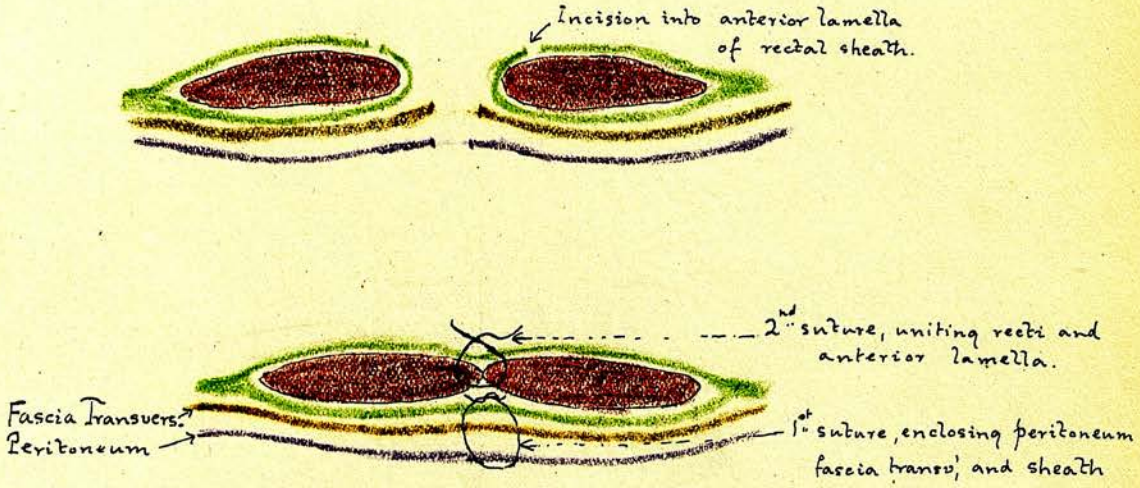
tied, the knot on the inside, starting from the serous to mucous and from mucous to serous on the same side and then from serous to mucous on the other side. On pulling this tight, this invaginated the anterior lips of the wound by a modified Connell "roll-over" stitch. When this was completed a ~~through and through~~ Lembert suture was placed above it to seal the anastomosis which was then returned inside the lesser sac and the aperture in the greater omentum closed by a through and through continuous suture of iodine-tannic cat-gut. The transverse mesocolon being held taut the jejunum was then gently drawn on until the anastomosis was pulled out through the opening in the meso-colon, the opening in which was closed by 6 interrupted linen sutures placed at intervals, suturing the stomach wall to the meso-colon just above the anastomosis to prevent herniation.

The abdominal wall was then closed by the method introduced by Sir Harold Stiles:- A vertical incision equal in length to the original wound was made through the anterior sheath of each rectus near its medial border and the medial edges of these incisions included in interrupted cat-gut sutures which included peritoneum and fascia transversalis. This adds a "first line of defence" to the inherent weakness of the abdominal wall in this (supra-umbilical) region. The medial edges of the recti and the anterior layers of their sheaths were then stitched in the mid-line, and finally the skin wound was closed by an interrupted/

interrupted cat-gut suture.

The whole operation is known as

"The Posterior, no loop, anti-peristaltic gastro-jejunostomy".



Method of closing anterior abdominal wall to prevent ventral herniæ. (Sir. H. Stiles)

Progress Notes.

10.12.20. Saline given per rectum - 10 ozs. every 4 hours.

11.12.20. Patient looked better, but complained of cough.
Moist rales over both bases.

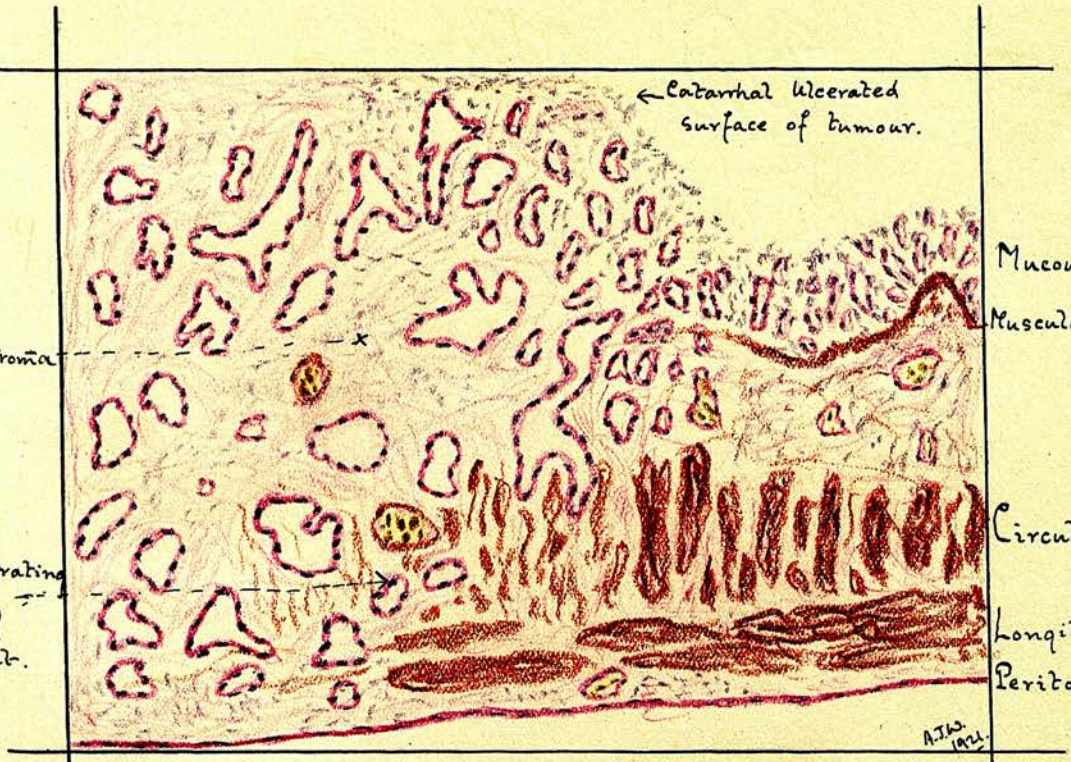
13.12.20. Patient gradually became weaker and died.

Sectio-Cadaveris:-

Basal pneumonia and hypostatic congestion of the lungs were found.

On opening into the pylorus an ulcerating mass extending on to the lesser curvature, was found. No metastatic growths could be found anywhere.

On microscopical examination this was found to be a typical adeno-carcinoma with much dense fibrous tissue. It had infiltrated through the muscular coat and was extending towards, but had not fully reached, the peritoneal surface.



Section showing Adeno-Carcinoma.

COMMENTARY.

This case is a striking example of the extreme difficulty experienced in many cases of pyloric obstruction, in deciding whether the stenosis is simple or malignant; that even when laparotomy is performed for the relief of the condition its nature may not be obvious, and that sometimes indeed post-mortem examination may fail to decide whether the stenosis was carcinomatous or not until microscopic examination has been made. The lesson therefore is that every tumour-like structure in the pyloric region must be treated as if it was malignant in nature.

A CASE OF ACUTE POST-PNEUMONIC EMPYEMA.

Case IV.

A. J. Wilson.

A CASE OF ACUTE POST-PNEUMONIC EMPYEMA.

Elizabeth C. Aet 10. School-girl. Admitted 24.1.21.
Ward 8, R.I.E.

Patient's History.

On 24.1.21 patient was sent in to the S.O.P.D. of the R.I.E. by her doctor with the following history. Patient had been ill with Lobar Pneumonia (left side), the crisis occurring on the 5th day. Soon after this the temperature rose again with sweats, and cough, and on examination of the chest the breath sounds were feeble with absence of rales and on percussion dulness extended from the base upwards as far as the spine of the scapula. On aspiration with a needle, pus was withdrawn and a diagnosis of Acute Empyema made. In the S.O.P.D. the chest was again explored with a needle and some orange-yellow fluid came out. On bacteriological examination this was found to contain some short Gram positive streptococci and an immediate operation was therefore indicated.

The Operation. (performed by Prof. Sir Harold Stiles)

As the patient's general condition was good, it was decided to use a general anaesthetic (chloroform and ether).

The/

The patient was placed on the operation table lying on the sound side with the arm of the other side flexed and adducted. In this position the inferior angle of the scapula is drawn forwards and upwards and the 7th rib is exposed. It is necessary to identify with certainty the 7th rib as a wound over this rib would be subsequently obstructed by the scapula when the arm descended to its normal position. The skin over the 8th rib was now drawn upwards so that the skin wound would correspond with that in the thoracic parietes after the bulging in the latter disappeared on thoracotomy, and an oblique incision about 3" long made along the 8th rib with its centre in the posterior axillary line. The incision went right down to the periosteum over the rib, dividing seriatim skin and fascia and lower border of latissimus dorsi (which is exposed in the posterior part of the incision)and the wound was deepened through the serratus anterior. These were than retracted and the rib thus exposed and an incision made through the periosteum in its long axis for about 2". A transverse cut was then made at each extremity of this incision and the periosteum raised towards the rib-borders with an elevator and the intercostal muscles detached. Doyen's periosteum elevator was then passed behind the rib and the periosteum separated from the deep surface of the rib/

rib by a lateral movement of the elevator, keeping the instrument close to the bone to detach the intercostal vessels from the groove in the lower border of the rib. Before removing the elevator a pair of rib shears were passed in and a piece of rib 1" long was removed avoiding injury to the intercostal vessels and nerves. The parietal pleura was thus exposed. An incision was now made in the latter in the line of the removed rib and a finger thrust in, and the effusion allowed to escape gradually, the condition of the pulse being carefully watched. The pleural cavity was explored by the fingers and no adhesions found. The fluid removed measured about 1½ - 2 pints and was of a thin watery straw-coloured nature. A rubber drainage tube with no lateral perforation except at its inner end was then inserted into the pleural cavity and fixed in position by a suture to the thoracic wall and the wound was closed up by silk-worm gut sutures.

Bacteriological Report.

Macroscopic characters:- Greenish-yellow somewhat turbid fluid.

Microscopic characters:- Large numbers of somewhat degenerated polymorphs. Organisms scanty. A few chains of Gram positive cocci with 6-8 in each chain.

Progress Notes:-

Drainage was quite efficient, the tube being removed on the 10th day, and blowing exercises carried out from the start. Discharged completely recovered on 23.2.21.

COMMENTARY.

The points of interest in this case are perhaps medical rather than surgical. Empyema as a complication of Pneumonia occurs in 2-3% of cases (Osler) and it is to be suspected if as in the present case, recurrence of the fever after the crisis with sweats and cough takes place. The physical signs and exploratory needle confirm the diagnosis.

The organisms chiefly associated with a post-Pneumonic Empyema is usually the Pneumococcus. Here it was a Streptococcus. This is of importance in prognosis, as pneumococcal cases usually run a favourable course without becoming chronic, while streptococcal are frequently fatal.

From the surgical standpoint aspiration in Empyema should only be employed as a diagnostic aid. It is not a curative measure and should only be employed to tide the patient over a critical period. The radical treatment is to incise and drain and to pay great attention in the after treatment to promoting the expansion of the lung.

TWO CASES OF ACUTE APPENDICITIS.

Cases V & VI.

A. J. Wilson.

TWO CASES OF ACUTE APPENDICITIS.

CASE A.

George P. Aet 19. Grocer's assistant.

Admitted 25.10.20. to Ward 7, R.I.E.

Patient's complaint:- Pain in right side. Duration 24 hrs.

History of the Illness.

Early in the morning of Sunday 24th October 1920 patient awakened with sudden pain around the umbilicus. This was not accompanied by vomiting but patient felt sick. After some hours during which the pain had been becoming gradually more and more severe, it gradually became more localised on the right side low down. The doctor was called in and sent patient into Ward 7, R.I.E.

Previous Health.

Prior to this attack patient had been in the best of health and had never had any symptoms suggestive of appendicular trouble.

Physical Examination 25.10.20.

Temperature 101.2°F.

Pulse 110.

On examination there was limitation of respiratory movement on the lower abdomen especially over the right iliac fossa. When cutaneous sensibility was tested after the method recommended by Ligat, viz. by grasping the skin firmly and drawing it away from the abdominal wall, definite sensitiveness (hyperalgesia) was found over an area situated about the junction of the inner and middle thirds of a line drawn from the junction of the anterior superior spine to the umbilicus, i.e. the "appendicular area".

On firm pressure over the right iliac fossa, pain was felt but on questioning the patient, this pain was discovered to be actually felt not in the region pressed upon but at the umbilicus. Muscular rigidity was well marked. Rectal examination showed some slight thickening to the right of the Pouch of Douglas.

The Operation.

Performed by Prof. Sir Harold Stiles on 25.10.21. McBurney's incision was employed - the incision running obliquely downwards and medially bisecting the junction of the right and middle thirds of a line joining the umbilicus to the anterior superior spine. The muscles were opened by the "gridiron" method, the muscles or aponeuroses being divided in the line of their fibres. On opening into the peritoneal cavity, free fluid was noted. The caecum was then exposed/

exposed and on following its anterior longitudinal band downwards the appendix was discovered lying in the retro-caecal position. The appendix was with some difficulty brought out through the wound and was found to be covered with lymph in a state of acute congestion and much thickened. The meso-appendix was clamped, the vessel running in its free edge being ligated before its first branch was given off, and the mesentery then divided. The appendix was then ligatured at its base, clamped beyond the ligature and the distal portion cut away. The stump was touched with B.I.P.P. and invaginated with a cat-gut purse-string suture. Finally the abdominal wall was closed in layers, the deeper layers being sutured with through and through iodine-tannic catgut, and the external oblique with interrupted similar sutures, and the skin edges being approximated with silk-worm-gut sutures.

The appendix was later opened out and acute injection of all coats throughout the whole length was found, with commencing gangrene of the tip.

Progress notes.

The patient made an uninterrupted recovery, being discharged completely recovered on 7.11.20.

CASE B.

John M. Aet 22. Student.

Admitted 15.2.21. Ward 7, R.I.E.

Patient's complaint:- Pain in the abdomen. Duration 24 hrs.

History of the Present Illness.

In the evening of Sunday 14th February 1921 after patient had retired to bed he was suddenly seized with acute abdominal pain which woke him out of sleep and doubled him up. The pain was felt around the umbilicus. It was of an acute colicky character and was at first intermittent, never perhaps passing away completely, but being aggravated by more acute spasms from time to time, the latter being accompanied by vomiting. The following morning the pain was much more severe but was now felt more in the right side low down. The vomiting continued and as the bowels had not moved the doctor was called in. On examination the temperature was found to be 99.9° and the pulse 80.

Physical Examination.

On examination in Ward 7 on the evening of the following day the condition was as follows:-

Patient looked very ill. The pulse was now 120 and the temperature/

temperature 102.5°. On inspection movement of the abdominal wall was practically nil, the breathing being almost entirely thoracic.

Cutaneous hyperalgesia was elicited on examining over the "appendicular area". On firm palpation over the right iliac fossa severe pain was felt which unlike Case A. was actually experienced and felt at the point of pressure, viz. McBurney's point. In addition to this there was generalised muscular rigidity over the whole of the lower abdomen especially of the right rectus.

Operation.

The method employed was that of Battle. The skin incision was a vertical one, parallel to and about an inch internal to the lateral margin of the right rectus. The rectus sheath was then divided and the outer border of the rectus having been defined by dissection was retracted inwards. The transversalis fascia and the lower part of the posterior layer of the rectus were then exposed and these were divided in the same line as the cutaneous incision. When the hand was introduced into the peritoneal cavity the appendix was found to be bound down by adhesions. These were broken down and the caecum (with the appendix) was delivered out of the abdominal wound. The appendix was in

a/

a condition of acute inflammation and its peritoneal coat covered by flakøy lymph. The artery in the mesoappendix was now ligated proximal to the point at which its first branch is given off and the appendix was clamped at its base and removed between forceps. The stump was then touched with B.I.P.P. and a catgut suture tied round it proximal to the crushing forceps and the whole then invaginated by a purse-string suture. The caecum was returned to the abdomen and the abdominal wall closed. The first suture included the peritoneum with the fascia transversalis and the divided portion of the rectus sheath, enough space being allowed for the insertion of a small rubber drain. The rectus muscle was then allowed to slip outwards into position again so as to cover and protect the suture line. The next suture closed the gap in the anterior sheath of the rectus and the skin incision was closed first with 2 interrupted relaxation sutures and secondly with continuous blanket sutures.

On section the appendix was found to contain 2 concretions and just below the point where the concretions were impacted there was a ring of necrosis going on to gangrene, while the lumen beyond was in a state of empyema.

Process/

Progess notes:-

Patient was kept in the Fowler position for the first 48 hrs., when the drain was removed. An uneventful recovery took place, the stitches being taken out on the 10th day. The patient was discharged on 25th February 1921.

C O M M E N T A R Y.

The 2 cases, although both are clinically cases of "acute appendicitis" contrast very forcibly both in their pathology and in the sequelae resulting if left untreated.

The wall of the appendix being rich in lymphoid tissue and specially exposed to invasion by the bacterial flora of the colon, is specially liable to organismal infection just like the tonsil and such an attack - an acute primary inflammation of the appendicular wall - is well illustrated in Case A.

Like inflammation elsewhere the results of bacterial invasion manifest themselves only gradually and the evidences of the success of the infective process only slowly appear. Thus the constitutional symptoms of acute appendicular inflammation are slow and insidious in their onset and reach their/

their maximum only after some hours. This is well illustrated in Case A.

The first symptom to appear is pain, and this is primarily felt not in the region of the inflamed viscus but in a totally different region. It has been shown by Mackenzie that the viscera themselves are quite insensitive to touch or pain, that the pain resulting from a lesion of a viscus is felt not <u>in</u> that viscus itself but is reflexly referred to the peripheral distribution of the spinal nerves arising from those segments of the spinal cord with which that viscus is supplied through its sympathetic nerves. Now in the case of the appendix the spinal segments concerned are the 8 - 11 thoracic and thus the pain is felt round the umbilical region, the umbilicus corresponding to the 10th thoracic.

Later the pain usually, (but not in Case A) settles down in the right side especially over McBurney's point, but the mechanism here is quite different. This is not like the initial pain a reflex phenomenon but is due to the spread of the inflammatory processes through the appendicular wall to the adjacent parietal peritoneum, and this being in connection with the cerebro-spinal system is accurately localised. This later pain therefore means spread to the parietal peritoneum and the localisation of it in any particular/

particular area indicates immediate proximity of the diseased viscus, - in the present case the appendix.

In Case A. the pain on palpation was felt not over the region pressed upon but around the umbilicus. The explanation of this is that owing to the retro-caecal position of the viscus there was no inflammatory extension to the parietal peritoneum and on deep palpation what one pressed was not an inflamed parietal peritoneum but the appendix itself, the stimulus on reaching the cord via the sympathetic being referred to the "umbilical region" and not to McBurney's point.

Temperature and acceleration of the pulse which are the usual accompaniments of inflammatory processes, were present from the first in Case A but absent in Case B. The explanation of the latter will be referred to shortly.

The Cutaneous Hyperalgesia and Muscular Rigidity.- In the normal state impulses are constantly passing both in an afferent direction from the viscera to the cord and efferently from the cord to the skin and muscles of the abdominal wall without our being aware of their existence. If a viscus becomes diseased the afferent impulses being of a more irritant nature, the segments of the cord receiving these impulses are in a state of hyper-excitability, their value of threshold stimulus being lowered as in tetanus or strychnine/

strychnine poisoning. Thus in the case of the cutaneous sensory nerve any stimulus which normally produces merely a sensation of touch, now causes severe pain, the skin surface concerned being hyperalgesic. This, Mackenzie has called the viscero-sensory reflex. Further these hyperalgesic areas while serving to indicate the organ at fault (through their localisation in definite areas), yet are quite unaffected by the position of that organ in the abdominal cavity. Thus in Case A. although the appendix was abnormal in position (retro-caecal) yet there was cutaneous hyperalgesia present in the "appendicular area".

In a similar fashion muscle tonus is reflexly increased giving muscular rigidity of the abdominal wall analogous to muscle spasm in acute synovitis - the "viscero-motor" reflex of Mackenzie.

When we come to consider Case B. the pathological picture is quite different. The appendix being a hollow viscus is also liable to have its lumen obstructed, and the condition resulting differs entirely from an inflammation of the wall as in Case A but is more of the nature of a colic. This, Mr Wilkie has called Acute Appendicular Obstruction. But it differs from, say, a renal colic in that here we are dealing with/

with a blind tube and the pathology is consequently altogether different.

The clinical features resemble other abdominal colics in their sudden onset - the pain reaches its maximum at once, by its temporary cessation and its subsequent recurrence, all of which points are well illustrated in Case B. Further, there being no inflammatory process, there is - at first at any rate - a conspicuous absence of increased temperature and accelerated pulse.

The pathological changes and accompanying clinical phenomena following on the acute obstruction depend on a number of factors to elucidate which Mr Wilkie has carried out on the experimental animal a series of investigations. His results may be summarised as follows:-

"Complete obstruction of the lumen of the appendix near its caecal end is followed by changes which depend on the presence or absence of faecal contents in its lumen:

(a) Obstruction of the empty appendix leads to a mucocele;

(b) If very little faecal matter is present, to an empyema.

(c) If much faecal matter is present, to gangrene and perforation."

In Case B the pathological sequence was probably acute obstruction of the lumen leading to empyema, necrosis at the seat of impaction, gangrene of the tip of the viscus and commencing/

commencing peritonitis. The sudden obstruction was accompanied by the reflex pain referred to the umbilicus, while there being no infective processes as yet - the pulse and temperature were unaltered. When infection, with gangrene and necrosis of the wall supervened then all the symptoms of an acute inflammatory appendicitis were super-added, viz. temperature, accelerated pulse, vomiting, muscular rigidity and cutaneous hyperalgesia (the viscero-motor and viscero-sensory reflex as already referred to), while inflammatory spread to the adjacent parietal peritoneum explains the transference of the pain to McBurney's point. Later involvement of the peritoneal cavity augmented all the constitutional and physical phenomena.

Case B brings out a point to which attention has been called by Mr Wilkie that in these cases of appendicular obstruction - appendicular symptoms have previously been present, especially that type of "dyspepsia" associated with chronic appendicular lesions - "indigestion" after definite articles of diet, especially green vegetables. The latter is of interest in view of the large part that the appendix plays in herbivora in vegetable digestion.

The retro-caecal appendix of Case A reminds us that the appendix in development has to descend from the region of the gall-bladder before it comes to lie in the right iliac fossa, and any failure to descend may cause difficulty in differential diagnosis of acute appendicitis and acute cholecystitis and further predisposes by kink formation to appendicular inflammation and calculus formation.
